10 and sample 6 has been obtained by changing height of stand 11. To indicate the advantageous distance control of the present invention, the distance between silicon film 10 and sample 6 is set to a value larger than one half of the sample diameter, i.e., 140 mm. As can be seen from the graph of Fig. 4, although the etching speed is not greatly influenced by the distance, the etching selectivity remarkably varies depending on the distance. Particularly, the etching selectively is advantageously improved when compared with the etching selectivity in the distance below one half of the sample diameter, i.e., about 100 mm. This confirms usefulness of the present invention.

A1 cont

IN THE CLAIMS:

Please amend the claims as follows:

A8

1. (amended) A plasma etching system for use with a surface etching apparatus in which in a vacuum chamber including vacuum generating means, source material gas supply means, sample setting means, and high-frequency power applying means, the source material gas is transformed into plasma to achieve surface etching of the sample, means for generating the plasma including electromagnetic wave supply means and magnetic field generating means, comprising:

control means for introducing the electromagnetic field from a planar plate disposed in parallel with the sample into the vacuum chamber, for setting distance between the plate and

the sample to a value in a range from 30 mm to one half of the smaller one of diameters respectively of the sample or the plate, and for controlling a quantity of reaction between a surface of the planar plate and radicals in the plasma;

means for making radicals incident to a surface of the sample uniform in quantity and type thereof including a ring-shaped member disposed in a periphery of the sample; and

means for reducing variation in time of radicals incident to the sample.

2. (amended) A plasma etching system in accordance with Claim 1, wherein the planar plate has a diameter ranging from 0.7 times that of the sample to 1.2 times that of the sample.

A8 Cont

3. (amended) A plasma etching system in accordance with Claim 1, wherein the electromagnetic wave to generate plasma has a frequency ranging from 300 MHz to 500 MHz.

Sub C

4. (amended) A plasma etching system in accordance with Claim 1, wherein the electromagnetic field generated by the electromagnetic field generating means to generate plasma has intensity satisfying a condition for electron cyclotron resonance between the planar plate and the sample.

5. (amended) A plasma etching system in accordance with Claim 1, wherein the means for controlling reaction between

the surface of the planar plate and the plasma is means for superposing an electromagnetic wave of a second frequency onto the planar plate, the electromagnetic wave being different from the electromagnetic wave of a frequency ranging from 300 MHz 500 MHz.

6. (amended) A plasma etching system in accordance with Claim 1, wherein the means of controlling reaction between the surface of the planar plate and the plasma is means for controlling temperature of the planar plate.

A8 cont

7. (amended) A plasma etching system in accordance with Claim 5, wherein the means for controlling reaction between the surface of the planar plate and the plasma is means for superposing an electromagnetic wave of a second frequency onto the planar plate, the electromagnetic wave being different from the electromagnetic wave of a frequency ranging from 300 MHz 500 MHz and the means of controlling reaction between the surface of the planar plate and the plasma is means for controlling temperature of the planar plate.

8. (amended) A plasma etching system in accordance with Claim 5, wherein:

the second frequency of the electromagnetic wave superposed to the planar plate ranges from 50 kHz to 30 MHz; and

the frequency applied to the planar plate has power of 0.05 W/cm^2 to 5 W/cm^2.

9. (amended) A plasma etching system in accordance with Claim 1, wherein:

the planar plate includes a plurality of holes; and

the source material gas is supplied through the holes.

10. (amended) A plasma etching system in accordance with Claim 1, wherein the planar plate includes a surface to be brought into contact with the plasma,

the surface being made of silicon, carbon, silicon carbide, quartz, aluminum oxide, or aluminum.

11. (amended) A plasma etching system in accordance with Claim 6, wherein the means for controlling temperature of the planar plate controls the temperature by circulating a liquid of which temperature is controlled in the planar plate.

12. (amended) A plasma etching system in accordance with Claim 10, wherein the gas supplying means is arranged at a position in the vacuum chamber,

the position is at an inner position of the vacuum chamber relative to the material surface arranged on the surface of the planar plate to be brought into contact with the plasma.

Please cancel claim 13 without prejudice or disclaimer of the subject matter thereof.

14. (amended) A plasma etching system in accordance with Claim 1, wherein the ring-shaped member includes a surface to be brought into the plasma,

the surface being made of silicon, carbon, silicon carbide, quartz, aluminum oxide, or aluminum.

A9

15. (amended) A plasma etching system in accordance with Claim 1, wherein the ring-shaped member is applied with high-frequency power.

16. (amended) A plasma etching system in accordance with Claim 15, further including a wherein member to apply high-frequency power to the ring-shaped member, wherein

the power applying member is so configured to separate part of the high-frequency power applied to the sample to apply the part to the ring-shaped member.

17. (amended) A plasma etching system in accordance with Claim 1, wherein means for reducing variation in time of radicals incident to the sample is a wall of the vacuum chamber and the planar plate and means for control of temperature of the ring-shaped member.

18. (amended) A plasma etching system in accordance with Claim 14, wherein the ring-shaped member has a height ranging from 0 mm to 40 mm relative to the sample surface in a direction vertical to the sample surface.

19. (amended) A plasma etching system in accordance with Claim 14, wherein the ring-shaped member has a width ranging from 20 mm to the distance between the planar plate and the sample in a direction horizontal to the sample surface.

Sub 27

20. (amended) A plasma etching system in accordance with Claim 16, wherein the member to apply high-frequency power to the ring-shaped member and to separate part of the high-frequency power applied to the sample is a capacitor or has a function of a capacitor.

A9 cont

21. (amended) A plasma etching system in accordance with Claim 1, wherein the planar plate to supply an electromagnetic wave into the vacuum chamber is coupled via a dielectric substance to a plate at an earth potential.

22. (amended) A plasma etching system in accordance with Claim 1, wherein:

the planar plate has a shape of a disk;

the planar plate has a central section connected to a conductor in a shape of a circular cone; and

the planar plate supplies the electromagnetic wave via the conductor.

23. (amended) A plasma etching system in accordance with Claim 17, wherein:

the means for controlling temperature of the vacuum chamber, the planar plate, and the ring-shaped member controls the temperature by circulating a liquid of which temperature is controlled; and

the temperature controlled ranges from 20°C to 140°C.

A9 Cont

24. (amended) A plasma etching system in accordance with Claim 1, wherein the magnetic field generated by the magnetic field generating means has magnetic lines of force, the lines having a direction vertical to the planar plate and the sample surface of Claim 1.

25. (amended) A plasma etching system in accordance with Claim 1, wherein the magnetic field generated by the magnetic field generating means has magnetic lines of force, the lines having a direction substantially vertical to the planar plate and the sample surface of Claim 1.

26. (amended) A plasma etching system in accordance with Claim 1, wherein all or part of the surface of the planar

plate to be brought into contact with the plasma is coated with dielectric.

27. (amended) A plasma etching system in accordance with Claim 26, wherein the dielectric covering all or part of the surface of the planar plate to be brought into contact with the plasma is quartz, aluminum oxide, silicon nitride, or polyimide resin.

Sub C3

A9 Cont

28. (amended) A plasma etching system in accordance with Claim 26, wherein temperature of the dielectric is controlled to a fixed value in a range from 20°C to 250°C.

29. (amended) A plasma etching system in accordance with Claim 1, further including a filter in a power supply path to supply the electromagnetic wave with a frequency ranging from 300 MHz to 500 MHz to the planar plate,

the filter allowing the high-frequency power applied to the sample to flow to the earth.

30. (amended) A plasma etching method for use with a plasma etching system in accordance with Claim 1, comprising the step of applying the high-frequency power with a frequency ranging from 200 kHz to 14 MHz to the sample with a density of 0.5 W/cm^2 to 8 W/cm^2 to achieve surface processing of the sample.

31. (amended) A plasma etching system in accordance with Claim 15, wherein the high-frequency power is applied to the ring-shaped member with a density of 0 W/cm^2 to 8 W/cm^2 in the surface of the member to be brought into contact with the plasma.

Sub C1

32. (amended) A plasma etching system in accordance with Claim 1, wherein:

a height relative to the sample surface and a width of the magnetic field region associated with the electron cyclotron resonance condition generated between the planar plate and the sample by the magnetic field generating means are controlled; and

A9 Cont

radicals generated in the plasma is controlled.

33. (amended) A plasma etching system in accordance with Claim 3, wherein:

the vacuum chamber includes an upper section made of an insulating material, i.e., quartz or aluminum oxide;

Sub B1 C2

the system further including, on an atmosphere side of the insulating material, a planar plate arranged via dielectric at an earth-potential; and

the electromagnetic wave is applied to the planar plate to generate plasma in the vacuum chamber through reaction between the electromagnetic wave and the magnetic field.

34. (amended) A plasma etching system for etching a sample in a vacuum chamber including vacuum generating means, source material gas supply means, sample setting means, and high-frequency power applying means, the source material gas is transformed into plasma to achieve surface etching of the sample, means for generating the plasma including electromagnetic wave supply means and magnetic field generating means, wherein the sample is a planar sample, a ring-shaped member is disposed in a periphery of the sample so as to make radicals incident to a surface of the sample uniform in quantity and type thereof, and a distance between the sample and a member facing the sample ranges from 30 mm to one half of a diameter of the sample.

A9 cont

Please cancel claim 35 without prejudice or disclaimer of the subject matter thereof.

36. (amended) A plasma etching system in accordance with Claim 34, wherein the member placed at a position facing the sample is made of quartz, aluminum oxide, silicon, silicon nitride, silicon carbide, or polyimide resin.

A10

37. (amended) A plasma etching method for use in a plasma etching system in accordance with Claim 1, comprising the steps of:

Sub 3

using a mixture of argon and C_4F_8 as the source material gas; and

etching a silicon oxide film under conditions that argon has a flow rate ranging from 50 sccm to 2000 sccm, C_4F_8 has a flow rate ranging from 0.5 sccm to 50 sccm, and the mixture has a pressure ranging from 0.01 Pa to 3 Pa.

38. (amended) A plasma etching method in accordance with Claim 37, further including the step of adding CO gas the mixture to etch a silicon oxide film, the CO gas having a flow rate ranging 50 sccm to 300 sccm.

A10 Cont

39. (amended) A plasma etching method in accordance with Claim 37, further including the step of adding oxygen gas to the mixture to etch a silicon oxide film, the oxygen gas having a flow rate ranging 0.5 sccm to 50 sccm.

40. (amended) A plasma etching method in accordance with Claim 37, further including the step of adding CHF_3, CH_2F_2, CH_4, CH_3F hydrogen gas, or a mixture thereof is added to the mixture to etch a silicon oxide film, the gas added having a flow rate ranging 0.5 sccm to 50 sccm.

41. (amended) A plasma etching method for use with a plasma etching system in accordance with Claim 1, further

including the step of using C_2F_6, CHF_3, $C_3F_6O_5$, C_3F_8, or C_5H_8, C_2F_4, CF_3I, C_2F_5I, C_3F_6 gas to etch a silicon oxide film.

42. (amended) A plasma etching system, wherein CO gas is added to the gas of Claim 41 to etch a silicon oxide film.

Sub 37

43. (amended) A plasma etching system, wherein oxygen gas is added to the gas of Claim 41 to etch a silicon oxide film.

A10 Cont

44. (amended) A plasma etching method for use in the plasma etching system in accordance with Claim 1, comprising the step of:

using as the source material gas a mixture of argon and C_5F_8; and

etching a silicon oxide film under conditions that argon has a flow rate ranging from 50 sccm to 2000 Sccm, C_5F_8 has a flow rate ranging from 0.5 sccm to 50 sccm, and the mixture has a pressure ranging from 0.01 Pa to 3 Pa.

45. (amended) A plasma etching method for use in the plasma etching system in accordance with Claim 1, comprising the step of:

using chlorine as the source material gas; and

etching a material of silicon, aluminum, wolfram, or a material primarily including silicon, aluminum, or wolfram

under a condition that the gas has a pressure ranging from 0.1 Pa to 4 Pa.

46. (amended) A plasma etching method for use in the plasma etching system in accordance with Claim 1, comprising the step of:

Sub B3

using HBr as the source material gas; and

etching a material of silicon, aluminum, wolfram, or a material primarily including silicon, aluminum, or wolfram under a condition that the gas has a pressure ranging from 0.1 Pa to 4 Pa.

A10 Cont.

47. (amended) A plasma etching method for use in the plasma etching system in accordance with Claim 1, comprising the step of:

using a mixture of chlorine and HBr as the source material gas; and

etching a material of silicon, aluminum, wolfram, or a material primarily including silicon, aluminum, or wolfram under a condition that the mixture has a pressure ranging from 0.1 Pa to 4 Pa.

48. (amended) A plasma etching method in accordance with Claim 45, further including the step of:

adding oxygen gas to the source material gas to etch a material of silicon, aluminum, wolfram, or a material primarily including silicon, aluminum, or wolfram.

49. (amended) A plasma etching system in accordance with Claim 1, wherein methane gas, chlorine gas, nitrogen gas, hydrogen, CF_4, C_2F_6, CH_2F_2, C_4F_8, NH_3, NF_3, CH_3OH, C_2H_5OH or SF_6 is used as the source material gas to etch a material primarily including an organic substance.

50. (amended) A plasma etching system in accordance with Claim 1, wherein the magnetic field generated by the magnetic field generating means is intensity of 100 gauss or less between the planar plate and the sample.

51. (amended) A plasma etching system in accordance with Claim 1, wherein the plasma is generated without using the magnetic field generating means.

52. (amended) A plasma etching system in accordance with Claim 5, wherein the second electromagnetic wave superpose to the planar plate in accordance with Claim 5 is divided to obtain part thereof to supply the part to the sample.